

MODIS Cloud Optical and Microphysical Properties Product Collection 6 Update

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MODo6 Optical/Microphysical Product

Collection 6 update since MSTM 2011

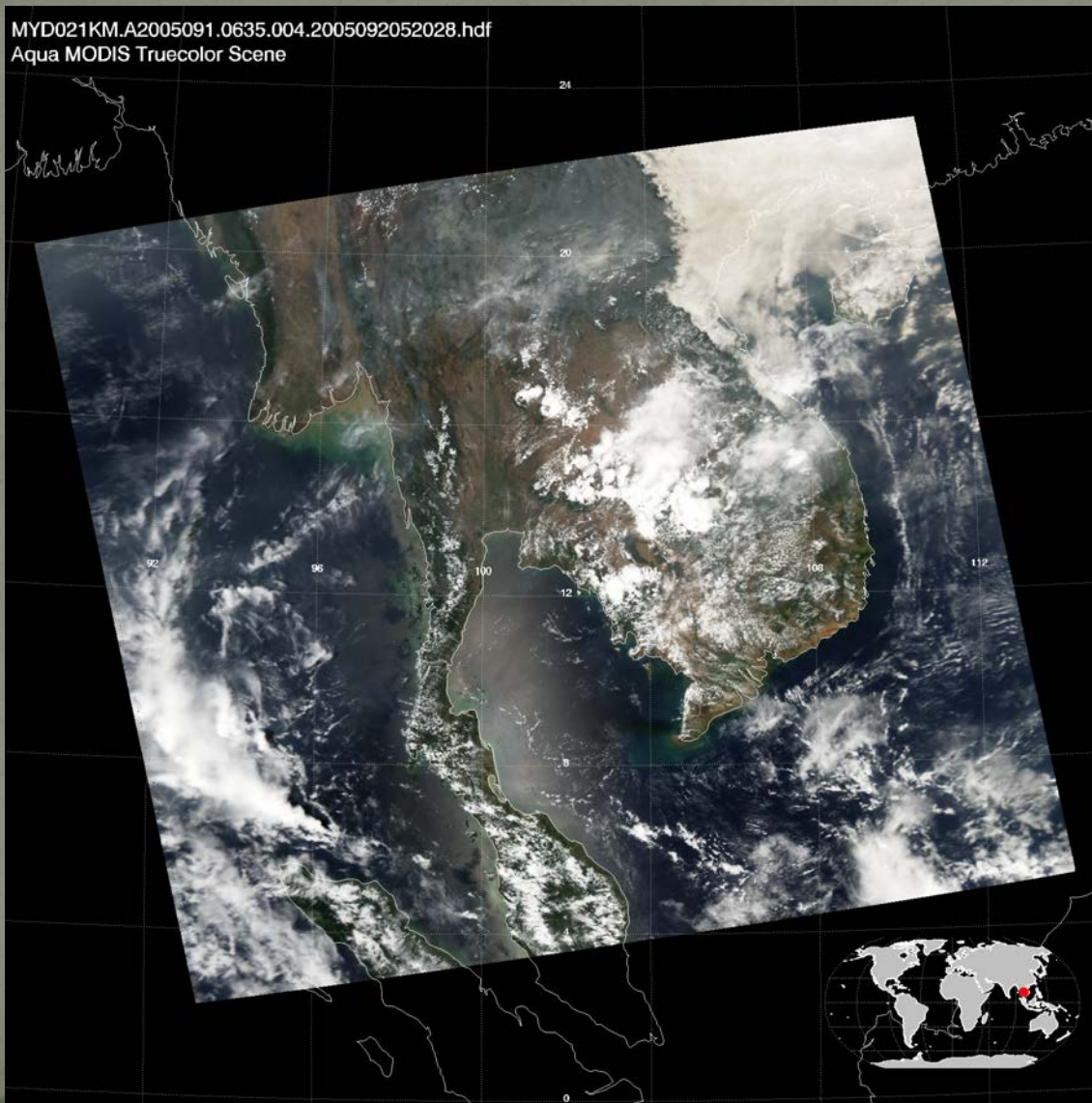
- **C6 Changes Highlights**

- Implemented iterative retrieval for $3.7\mu\text{m}$ cloud effective radius.
- Switched the $3.7\mu\text{m}$ retrieval to use more appropriate solar constant and atmospheric correction from MOD_PRO6CT model instead of table
- Added above-cloud atmospheric emission and surface emissivity to $3.7\mu\text{m}$ retrieval
- Integrated land spectral surface albedo: new combined Aqua/Terra gap-filled C5 product from BU team.
- Improved algorithm performance
- Aggregated to L3 clear-sky restored pixels
- Cloud optical thickness maximum at 150.
up from 100.
- Improved valid radiance determination
- Pixels just outside library space retrieved via alternate solution technique



Example Retrieval

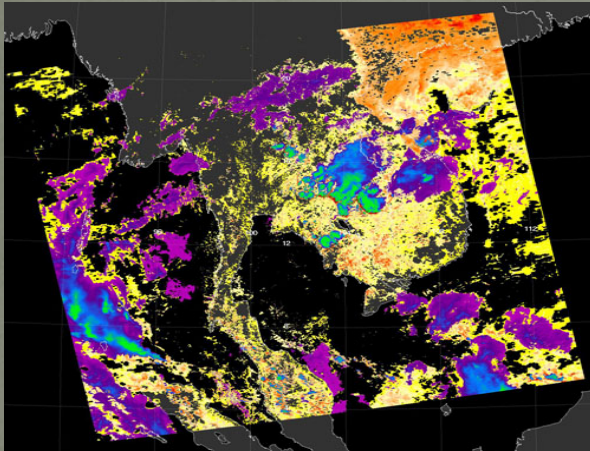
Aqua MODIS 2005 day 091 06:35 UTC



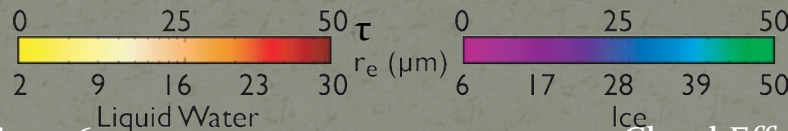
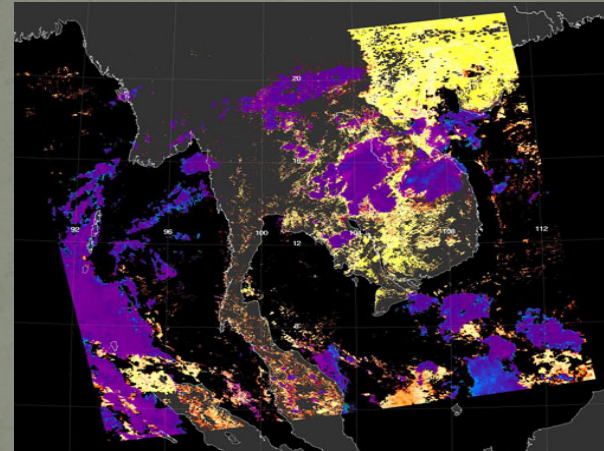
Example Retrieval

Example retrieval C51 v.51.0.7 vs C6 v.6.0.39 Aqua MODIS 2005 day 091 06:35 UTC

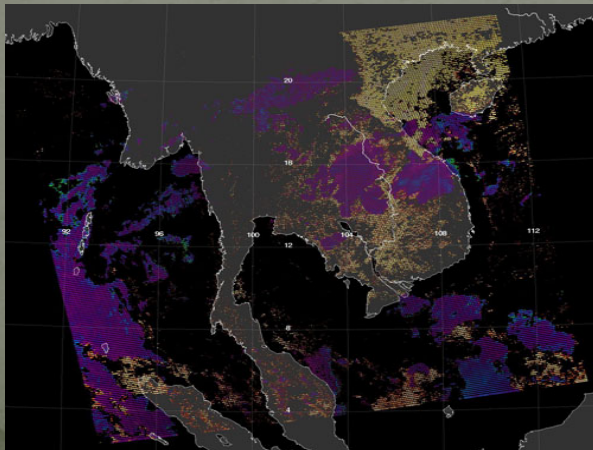
Cloud Optical Thickness



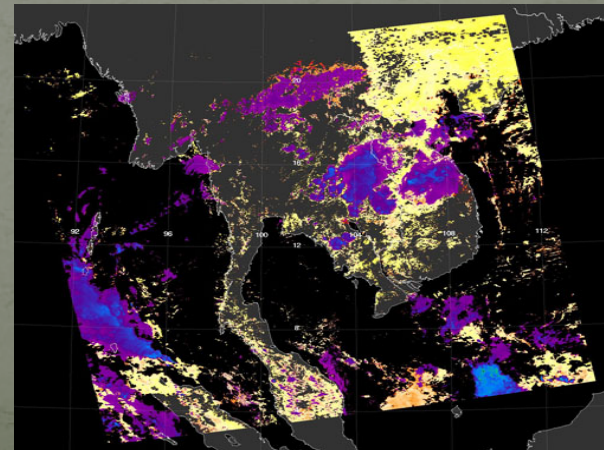
Cloud Effective Radius 2.1μm



Cloud Effective Radius 1.6μm



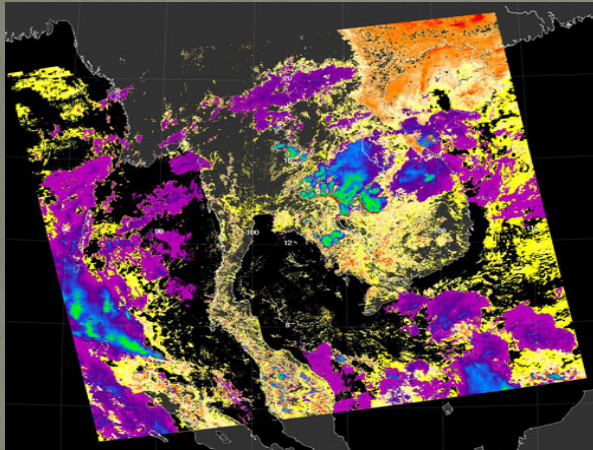
Cloud Effective Radius 3.7μm



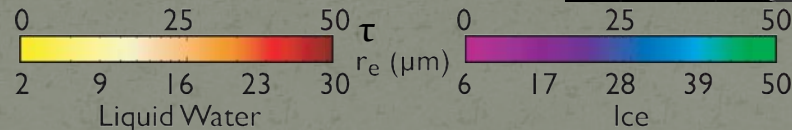
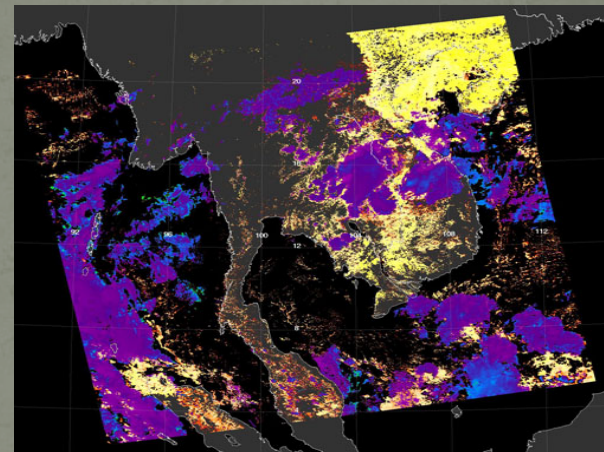
Example Retrieval

Example retrieval C51 v.51.0.7 vs C6 v.6.0.39 Aqua MODIS 2005 day 091 06:35 UTC

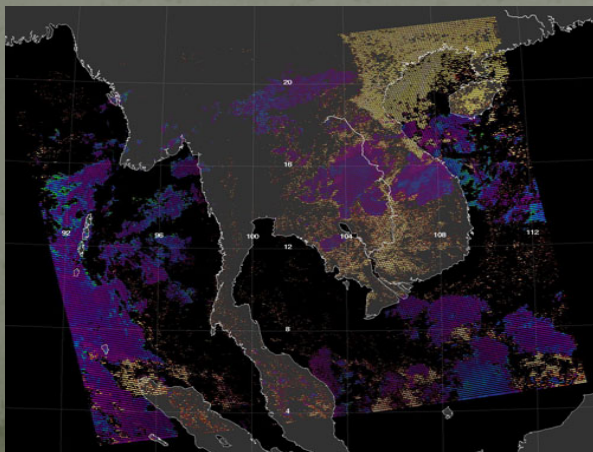
Cloud Optical Thickness



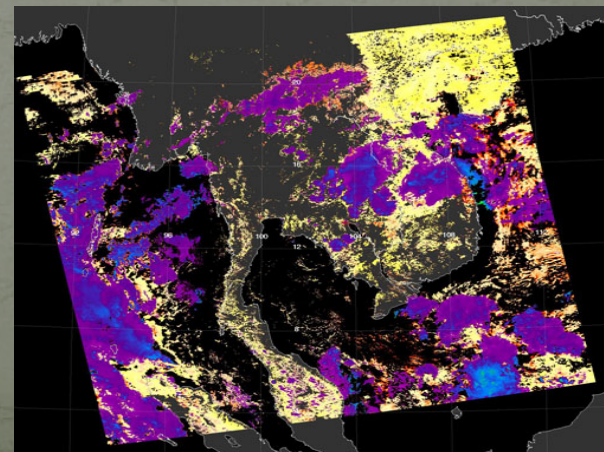
Cloud Effective Radius 2.1μm



Cloud Effective Radius 1.6μm



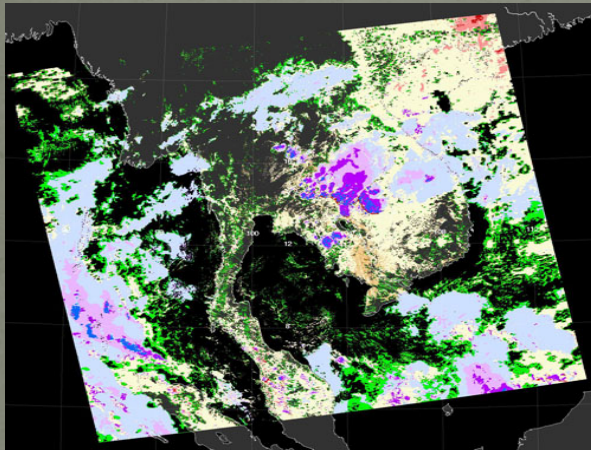
Cloud Effective Radius 3.7μm



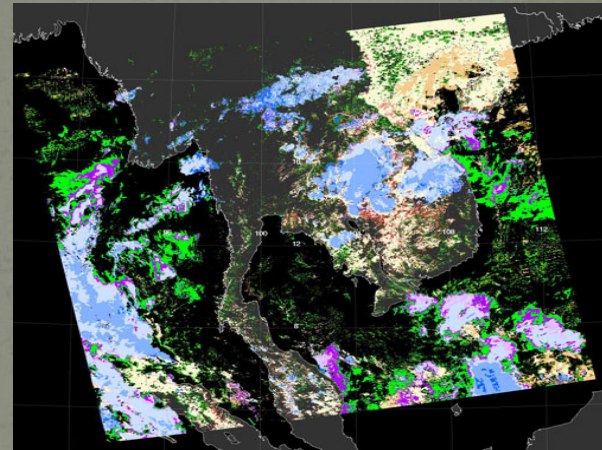
Example Retrieval

Example retrieval C51 v.51.0.7 vs C6 v.6.0.39 Aqua MODIS 2005 day 091 06:35 UTC

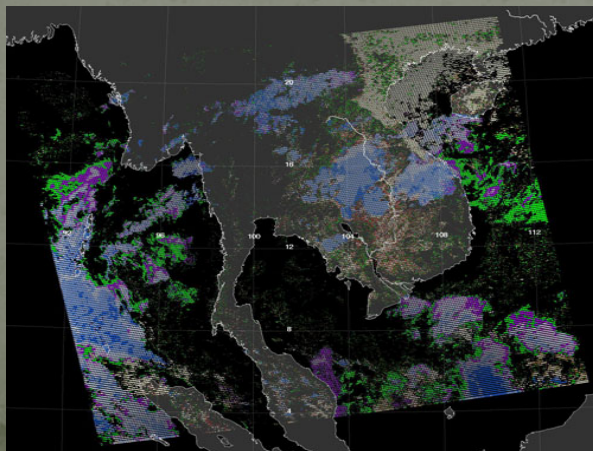
Cloud Optical Thickness



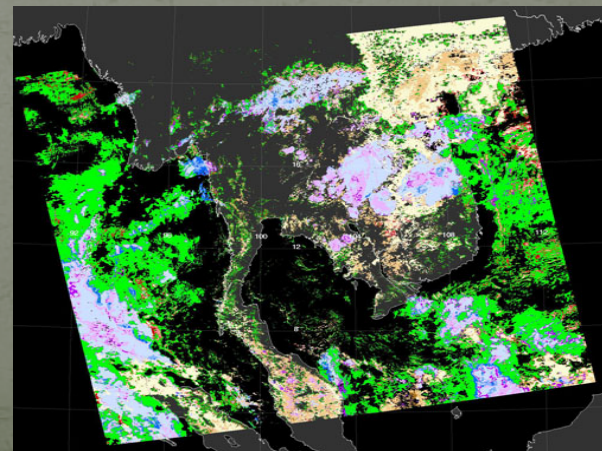
Cloud Effective Radius 2.1 μ m



Cloud Effective Radius 1.6 μ m



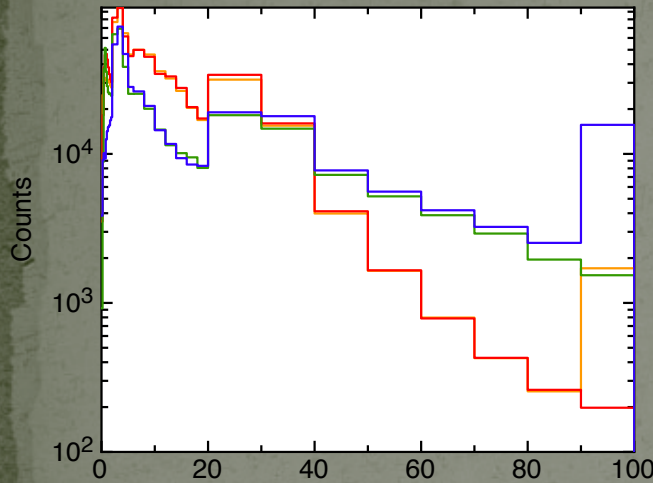
Cloud Effective Radius 3.7 μ m



Example Retrieval

Retrieval histograms before and after

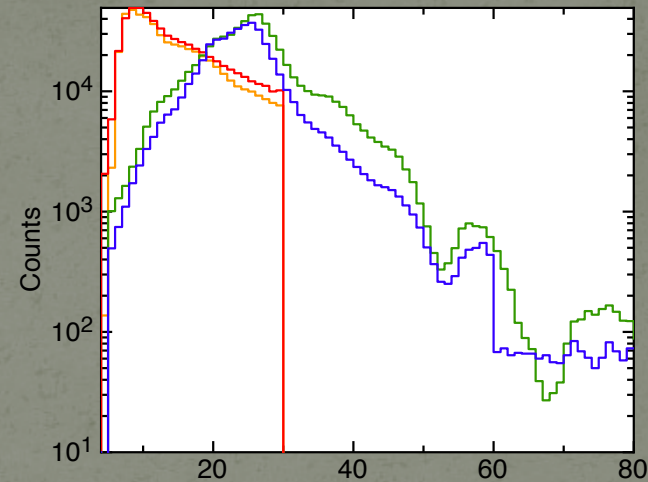
Cloud Optical Thickness



Means:
L51: 6.235
I51: 11.248
L6: 6.048
I6: 9.20

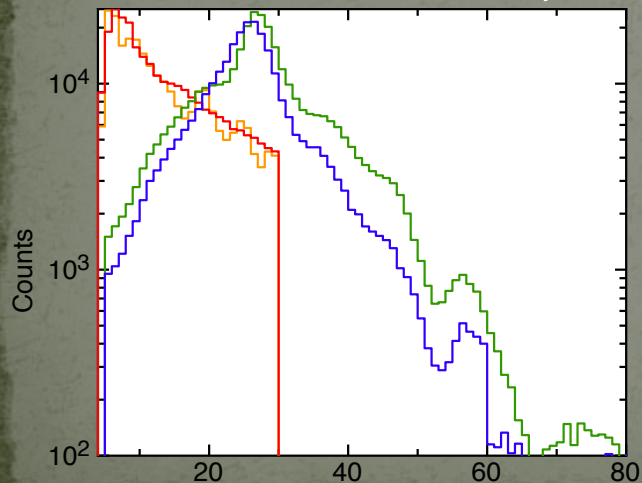
— Liquid C51
— Liquid C6
— Ice C6
— Ice C51

Cloud Effective Radius $2.1\mu\text{m}$



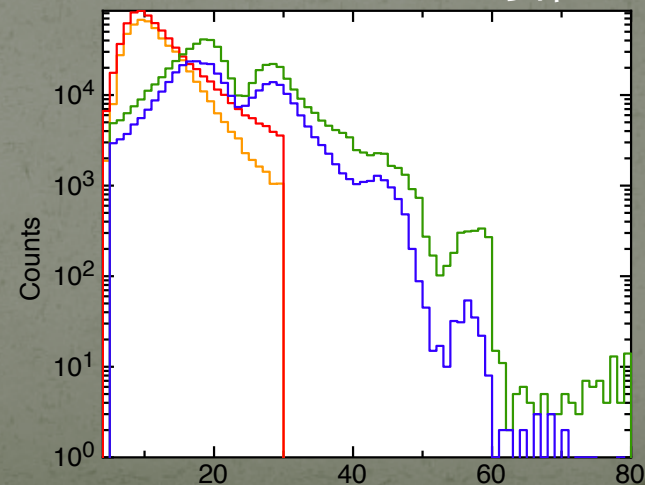
Means:
L51: 14.48
I51: 24.78
L6: 14.78
I6: 26.05

Cloud Effective Radius $1.6\mu\text{m}$



Means:
L51: 13.47
I51: 26.54
L6: 13.46
I6: 28.011

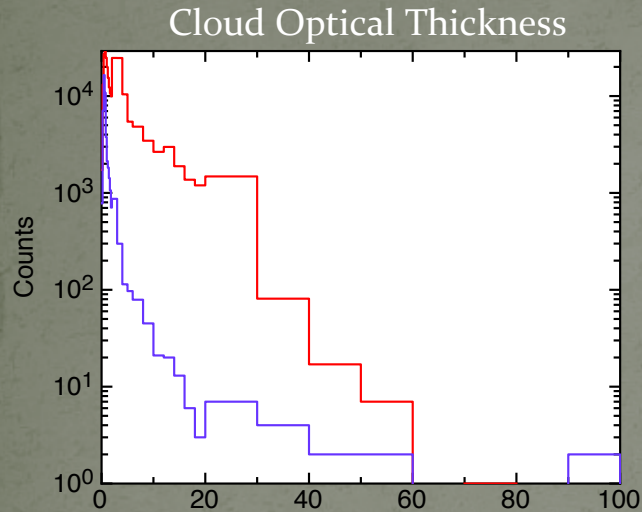
Cloud Effective Radius $3.7\mu\text{m}$



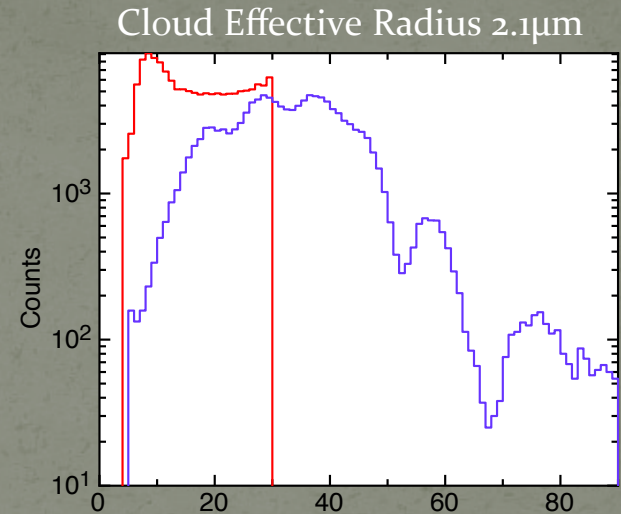
Means:
L51: 11.828
I51: 21.08
L6: 12.23
I6: 21.70

Example Retrieval

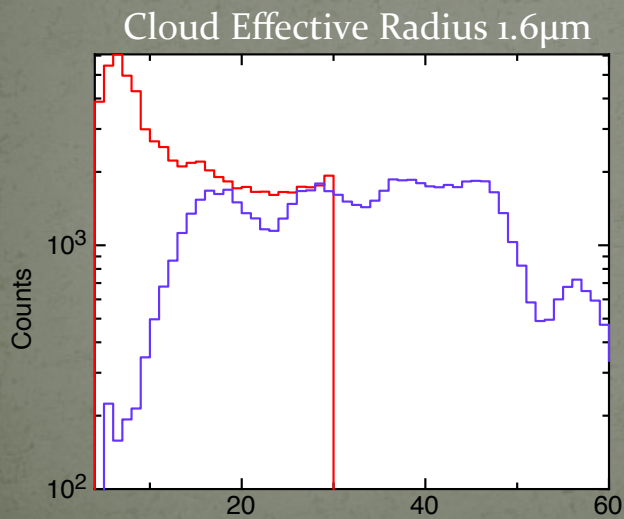
Retrieval histograms for new successful retrievals only



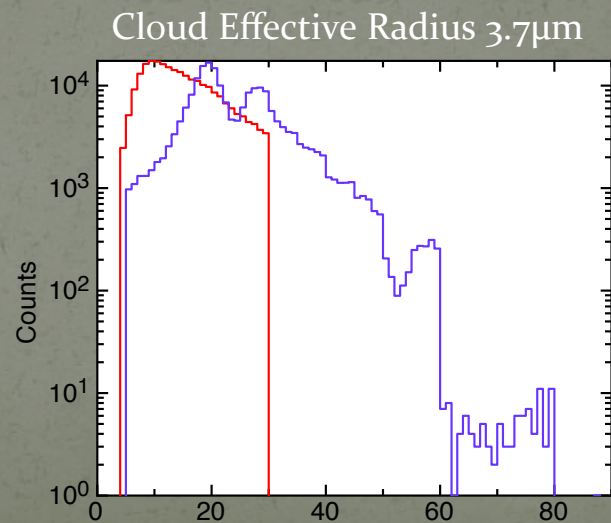
Means:
Liq: 2.245
Ice: 0.693



Means:
Liq: 16.726
Ice: 33.457



Means:
Liq: 14.075
Ice: 34.775



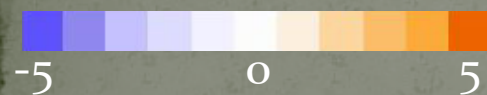
Means:
Liq: 14.93
Ice: 24.264

MOD_PRo6OD Through the Ages

Retrieval changes relative to C5.1

Cloud Optical Thickness

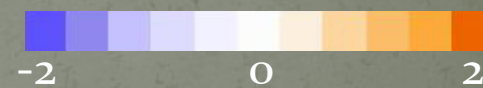
5 6
1 0
7 2 5 6 12 15 20 23 24 24 28 32 36 37 38



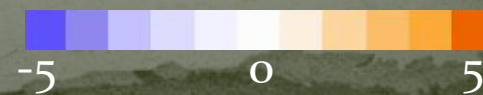
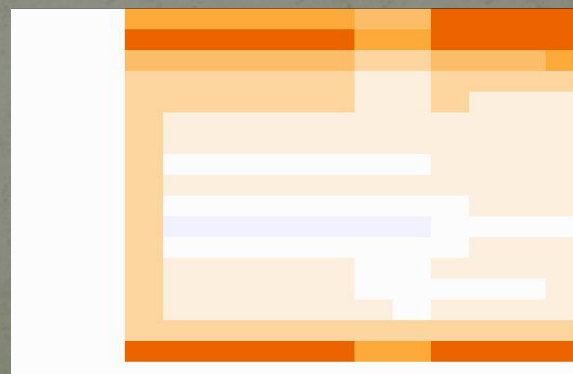
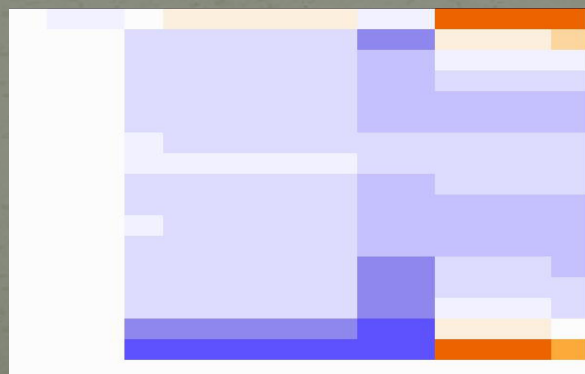
Liquid
All
Surfaces

Cloud Effective Radius $2.1\mu\text{m}$

5 6
1 0
7 2 5 6 12 15 20 23 24 24 28 32 36 37 38

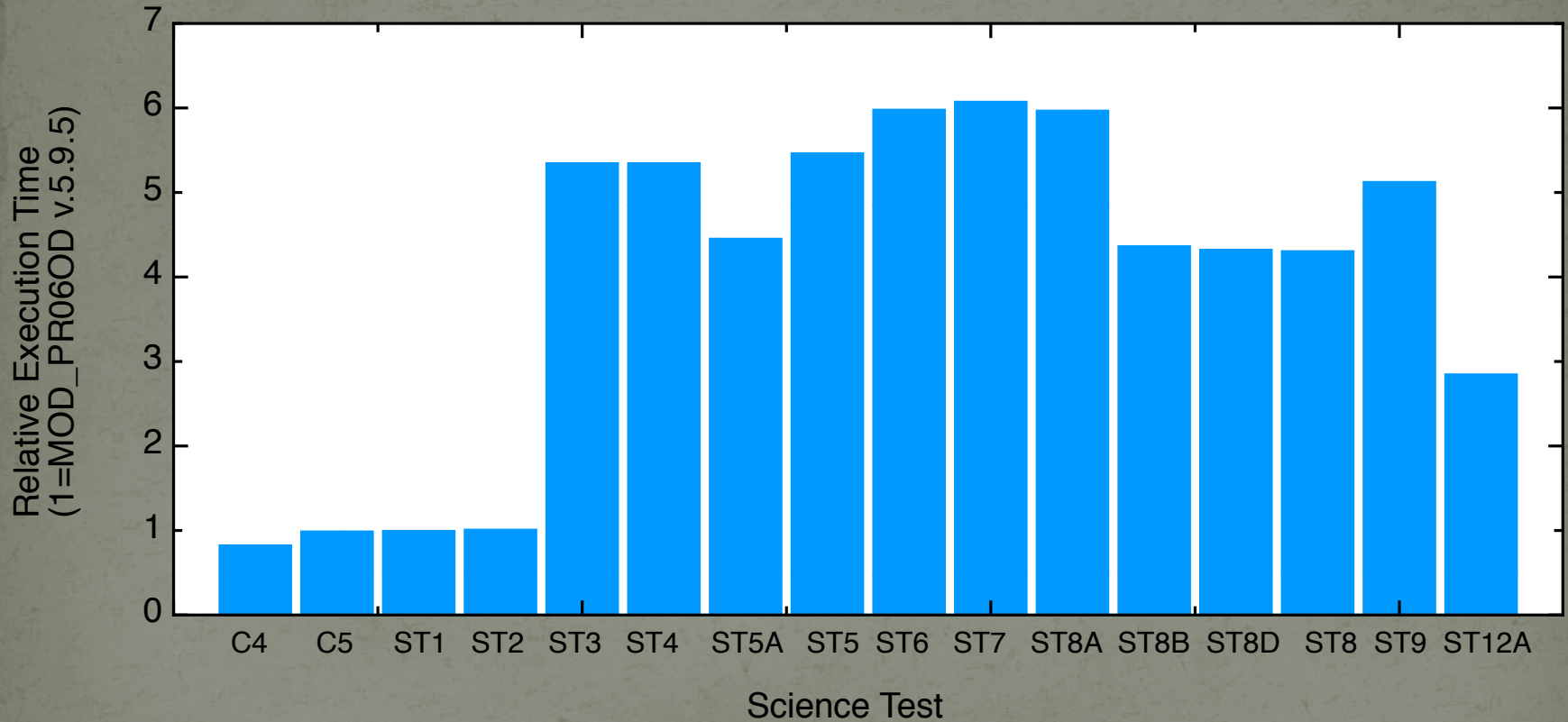


Ice
All
Surfaces



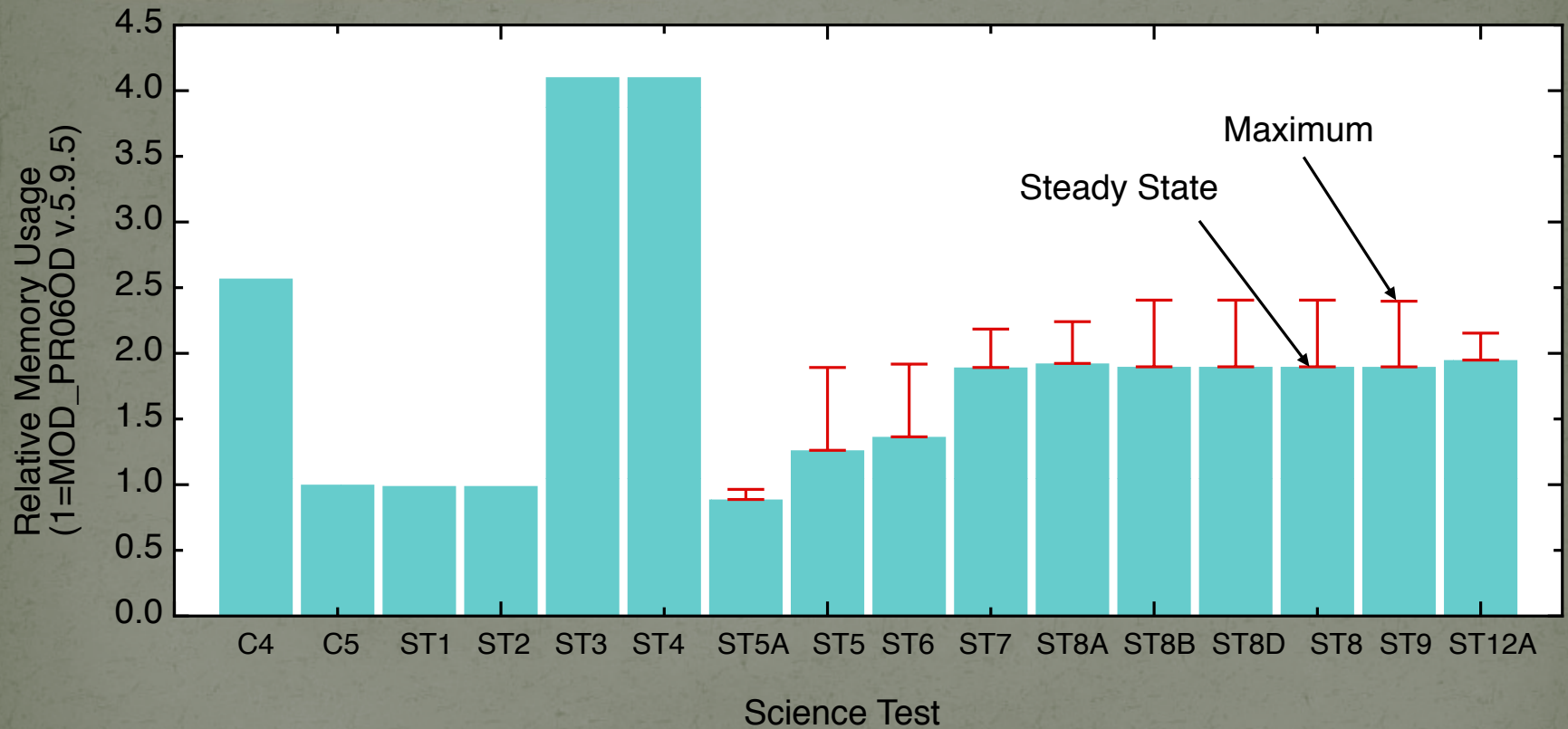
MOD_PRo6OD Through the Ages

Product execution time for an average granule (70% cloudy)



MOD_PRo6OD Through the Ages

Product RAM usage for an average granule (70% cloudy)



Conclusion

- **Current Status: PGEo6 v.6.o.42 about to be delivered**
 - 12 out of planned 15 tests completed
 - Science changes left to implement:
 - New thermodynamic phase
 - New ice crystal models
 - RGB color tests for clear sky restoral
 - 3.7 μm retrieval uncertainty due to emission component
 - Finalize L3 aggregation additions and changes (possible impact on L2 QA)
- **Take a look at our L2 poster for complete development status and timeline**